Modelling of climbing Plants

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Problem Statement

This project is based on the paper **Interactive Modeling and Authoring of Climbing Plants** which was produced at EUROGRAPHICS 2017 by Torsten Hädrich, Bedrich Benes, Oliver Deussen and Sören Pirk. We will try to create a system for the interactive modeling of developmental climbing plants with an emphasis on efficient control and plausible physics response. An intractable environment is expected so that we can show case the growth of the plant in real time within a biologically plausible way.

Challenges

1. Initialization, represented as planting the seed in the paper. This part will also include deciding the coding environment and getting the geometric shapes up.

2. Particle simulation, done by the paper for interactive implementation of pruning, wind blowing, etc. with the growing plant.

3. Plant growth, where we consider branching and tropism parameters for development of the plant. The paper uses anisotropic geometric shapes for representation of the different parts of the plant which are attached to each other. We can potentially change this to any shape, like a cylinder, etc.

4. Collision Handling, where the interaction of the plant parts with each other and the environment are handed.

Key Ideas

Since we want to simulate the growth of a climbing plant, the paper divides the problem into different situations. These include shape matching based on the predicted new particle position, growth handling based on two parameters viz. Surface Adaptation and Phototropism and Fluid simulation.

Growth Integration

This is the final and most important part as it depends on all the smaller issues handled above and brings it together to simulate the final growth required and the new particle positions obtained.

Result Summary

I.   Dynamic Editing

The user can edit the environment or add the plant seeds in an interactive manner in real time while the growth simulation should be able to handle it. Also live editing of the different parts of the plant should be made possible

II.   Collision Response

The plants have to detect collisions with the moving objects in the environment and grow around it accordingly. Also inter branch collisions generated for such cases have to be made biologically acceptable.

Implementation approach

The idea right now is to create the simulation logic in python and have a basic working of the different parts of the plant (the geometric shape representing the stem of the climber) render in the open source software "Blender". The implementation could be such that I have a script in blender which when I run does the growth simulation in Blender.

Reference

Interactive Modeling and Authoring of Climbing Plants